

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **TAUBER et. al**

Parent Application Serial No.: **09/845,108**

5 Parent Application Filed: **April 26, 2001**

Attorney Docket No.: **CECOM 5523**

For: **RARE EARTH METAL COMPOUNDS FOR USE IN HIGH CRITICAL
TEMPERATURE JOSEPHSON JUNCTIONS**

10 Sir:

In accordance with Revised Amendment Format, these Remarks are submitted to support amending the above-identified application.

REMARKS

15 Claims 1-79 are now in the case. Claims 1-48 and 50-79 are drawn to non-elected claims and have been withdrawn. Claim 49, as amended, is directed to a superconductor insulator superconductor step edge Josephson junction composed of a single layer of a copper oxide superconductor deposited onto a single crystal $\text{Sr}_2\text{YbSbO}_6$. New claims 80-84 have been added.

This is a divisional application of U.S. Patent Office Application Serial No. 09/845,108,
20 entitled, "Rare Earth Metal Compounds For Use In High Critical Temperature Thin Film Super-
Conductors, Ferroelectrics, Pyroelectrics, Piezoelectrics and Hybrids," which was designated as
CECOM Docket No. 5469 and filed on April 26, 2001, hereinafter the "parent case." In the
parent case (09/845,108), the Examiner issued a restriction requirement and following
Applicants' election of claims to Invention Group I and several amendments, the Examiner
25 issued a Notice of Allowance. The parent case (09/845,108) is currently pending before the U.S.
Patent Office, and this co-pending divisional application is prosecuting a previously non-elected
claim from the parent case.

The parent case (09/845,108) was a continuation in part of U.S. Patent Office Application
Serial No. 09/337,724, with the same title, filed on June 21, 1999, and designated as CECOM
30 Docket No. 5433, which was a continuation in part of U.S. Patent Office Application Serial No.
08/717,822 with the same title, filed on September 24, 1996 and designated as CECOM Docket

No. 5304. That application (Serial No. 08/717,822) was a continuation in part of U.S. Patent and Trademark Office Application Number 08/333,669 entitled, "Rare Earth Metal Containing Compounds and High Critical Temperature Thin Film Superconductors, Ferroelectrics, Pyroelectrics, Piezoelectrics, And Hybrids Including the Rare Earth Metal Containing Compounds," filed on November 3, 1994 and designated as CECOM Docket No. 5097, the "first application." It is respectfully submitted that the parent case (09/845,108) filed on April 26, 2001 by the inventors herein, is currently pending before the U.S. Patent Office and is therefore "an application similarly entitled to the benefit of the filing date of the first application," as mandated by 35 USC § 120 and 35 USC § 121, which is November 3, 1994. This divisional application's specification, as amended, claims priority from the November 3, 1994 effective filing date of the first application (08/333,669).

As required by the Revised Amendment Format, separate Amendments To The Claims, Amendments To The Specification and these Remarks are enclosed with this Amendment. The Examiner from the parent case (09/845,108) required a restriction to one of five groups of inventions under 35 USC § 121. In response to that restriction requirement, Applicants elected Invention Group I, which were drawn to a rare earth compound. In the parent case (09/845,108), the Examiner issued a Notice of Allowance allowing amended claims 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40 and 43. In this Preliminary Amendment to the within divisional application, Applicants seek to prosecute claim 49 from Invention Group V, which is drawn to a Josephson junction, classified by the United States Patent & Trademark Office in Class 505, subclass 190, comprising a single layer of a copper oxide superconductor deposited onto a single crystal substrate having the formula $\text{Sr}_2\text{YbSbO}_6$. This Preliminary Amendment revises previously non-elected claim 49 in a manner consistent with the parent case's allowed claims, includes a new claim 82 drawn to a copper oxide superconductor layer deposited onto a substrate having a $\text{Sr}_2\text{YbSbO}_6$ buffered layer and otherwise puts this divisional application in a condition for allowance. New dependent claims are also being added.

In the parent case (09/845,108), the Examiner rejected the claims under 35 USC § 103 as being obvious over an article by Fesenko entitled "Synthesis and Study of $\text{A}_2\text{Sb}_5\text{O}_6$ and $\text{A}_3\text{Sb}_{25}\text{B}'\text{O}_9$ -type Ternary Oxides with Perovskite Structure," an article by Wittmann et al.

entitled "On The Ordering Of B^{III} and M^V In Perovskites of the Type A₂B^{III}M^VO₆" and an article by Blasse entitled "New Compounds With Perovskite-Like Structures." After filing a Request For Continued Examination, claims 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40 and 43 were amended from objectionable dependent claims depending upon rejected base claims to independent claims for dielectric substrates. For example, claim 7 from the parent case (09/845,108) recited a dielectric substrate of the general formula Sr₂RESbO₆, further comprising the compound Sr₂YbSbO₆, where the general formula included an Sb⁵⁺ constituent atom with a polarizability of about 1.2 Å³, the dielectric substrate being heated for at least 20 hours at between 1400° C and 1600 ° C and being constructed in a bulk form, having a specific low dielectric constant and low dielectric loss and the dielectric substrate having an ordered perovskite pseudo-cubic tetragonal crystalline structure. It is respectfully submitted that reciting the crystalline structure of the parent case's dielectric substrates was a significant difference between them and cited prior art references supporting the allowability of those claims.

It is respectfully submitted that claim 49, as amended, now includes an ordered perovskite pseudo-cubic tetragonal crystalline structure similar to the parent case's allowed claims 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40 and 43. Claim 49, as amended, now recites a superconductor insulator superconductor step edge Josephson junction, comprising a single layer of a copper oxide superconductor deposited onto a single crystal substrate of the formula Sr₂YbSbO₆, the single crystal substrate being heated for at least 20 hours at between 1400° C and 1600 ° C and having a low dielectric constant of between 4.8 and 5.4, a low dielectric loss of less than 1 x 10⁻³ without a phase transition and a density GM/CC of 6.86 and an ordered perovskite pseudo-cubic tetragonal crystalline structure. Amended claim 49 also recites the single layer of the copper oxide superconductor being patterned, a second layer of Sr₂YbSbO₆ deposited onto the single layer of the copper oxide superconductor, the formula including an Sb⁵⁺ constituent atom with a polarizability of about 1.2 Å³ and a second layer of the copper oxide superconductor being deposited and patterned said second layer of Sr₂YbSbO₆. New dependent claims 80-81 recite additional details concerning patterning of the single layer of the copper oxide superconductor.

New independent claim 82 recites a Josephson junction comprising a copper oxide superconductor layer deposited onto a substrate having a buffered layer with the formula

Sr₂YbSbO₆, an ordered perovskite pseudo-cubic tetragonal crystalline structure for the Sr₂YbSbO₆ buffered layer, the buffered layer being heated for at least 20 hours at between 1400° C and 1600 ° C, having a low dielectric constant between 4.8 and 5.4, a low dielectric loss of less than 1.0×10^{-3} without a phase transition and a density GM/CC of 6.86 and the formula including an Sb⁵⁺ constituent atom with a polarizability of about 1.2 \AA^3 . Claim 82 also recites the copper oxide superconductor single layer being patterned, a second Sr₂YbSbO₆ layer of deposited onto the copper oxide superconductor single layer and a second copper oxide superconductor layer being deposited and patterned on the second layer of Sr₂YbSbO₆. New dependent claims 83-84 recite additional details concerning patterning of the single layer of the copper oxide superconductor. It is respectfully submitted that the ordered perovskite pseudo-cubic tetragonal crystalline structure feature is adequately supported by several specification passages. For example, specification page 3, lines 13-15, states:

Indexed powder diffractometer data taken using CuK α radiation, reveals these compounds to be ordered perovskites. With the exceptions of Sr₂LuSbO₆ and Sr₂LaSbO₆ that are cubic, all of the other compounds are found to be pseudo-cubic, tetragonal.

(Emphasis Supplied)

Similarly, specification page 5, lines 12-16 further describes crystalline properties:

These compounds are distorted from cubic. They are indexed on the basis of a tetragonal unit cell with two exceptions, Sr₂LuSbO₆ and Sr₂LaSbO₆ that are cubic. See TABLE I. All these compounds form an ordered perovskite structure in which alternate B site ions are occupied by Sb and a rare earth ion. This gives rise to weak reflections in the X-Ray diffraction powder pattern that requires doubling of the unit cell. (Emphasis Supplied)

Based on these specification references, it is respectfully submitted that the specification adequately supports the Sr₂YbSbO₆ single crystal substrate having an ordered perovskite pseudo-cubic tetragonal crystalline structure, which is neither taught nor suggested by the cited prior art references. Additionally, specification page 14, lines 14-19, adequately supports new claim 82 reciting a copper oxide superconductor layer deposited onto a substrate having a buffered layer with the formula Sr₂YbSbO₆, as follows:

A superconductor insulator superconductor step edge Josephson junction, a

multilayer superconducting device, is fabricated according to the invention using $\text{Sr}_2\text{YbSbO}_6$. More particularly, the device is made by depositing a single layer of HTSC on a single crystal $\text{Sr}_2\text{YbSbO}_6$ substrate or a substrate of other composition buffered with a layer of $\text{Sr}_2\text{YbSbO}_6$. Next, the HTSC is patterned by ion milling at a 45° angle. A layer of $\text{Sr}_2\text{YbSbO}_6$ is then deposited. Next, another HTSC layer is deposited and patterned to complete the device. (Emphasis Supplied)

The Amendments To The Specification relate to formal matters such as revising the title, adding a statement claiming priority from the November 3, 1994 effective filing date of the first application, substituting the term "Josephson junction" for "dielectric substrate" on specification page 2, lines 12-14 and correcting a few informalities, without adding any prohibited new matter.

For these reasons, it is respectfully submitted that claim 49, as amended, has been revised in a manner similar to allowed claims 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40 and 43 of the parent case (09/845,108). Therefore, it is respectfully requested that claim 48, as amended, and new claims 80-84 be allowed and pass to issue.

Should the Examiner require further information, the Examiner is invited to telephone the applicants' attorney at the telephone number listed below.

Respectfully Submitted,

18 February 2004

DATE



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